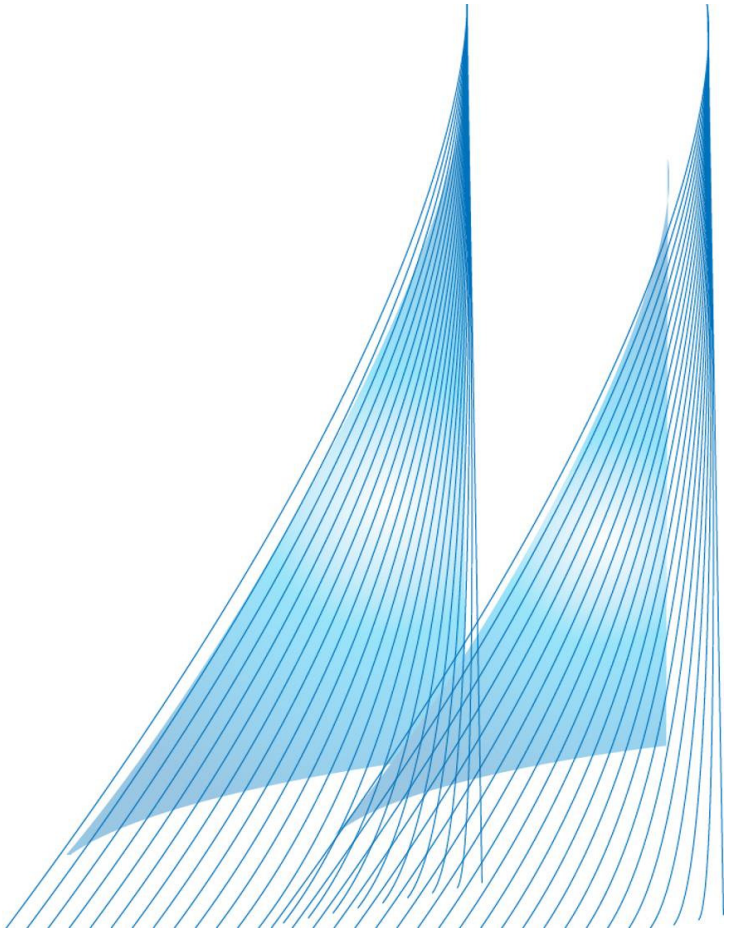
Background Paper and Report

Business and Public Policy Case for Battery Stewardship (handheld batteries)

Prepared for Sustainability Victoria

June 2013



Martin Stewardship & Management Strategies Pty Ltd

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Prepared by
Martin Stewardship & Management Strategies Pty Ltd
PO Box 755 Turramurra NSW 2074 Australia
Phone: (02) 9940 3571 Fax: (02) 9940 3491
admin@ms2.com.au
www.ms2.com.au
@RussMartinMS2 on Twitter
MartinStewardshipMS2 on Facebook

GLOSSARY

Act	*Product Stewardship Act 2011*
ABRI	Australian Battery Recycling Initiative
ACT	Australian Capital Territory
ARF	Advance Recycling Fee
BAN	Basel Action Network
Basel Convention	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal
Batteries Directive	Directive 2006/66/EC on Batteries and Accumulators
Battery World	Battery World Australia Pty Ltd
CHF	Swiss Francs
CMA	CMA Ecocycle
COAG	Council of Australian Governments
EC	European Commission
EOL	end of life
EPR	extended producer responsibility
EU	European Union
EUR	Euros
G&P	G&P Batteries Ltd
GlobalPSC	Global Product Stewardship Council
H_2SO_4	sulphuric acid
HHW	household hazardous waste
kg	kilogram
KOBAR	Kobar Limited
KOH	Potassium hydroxide
LCA	life-cycle assessment
MIT	Massachusetts Institute of Technology
MRI	MRI (Aust) Pty Ltd
MS2	Martin Stewardship & Management Strategies Pty Ltd
NiCd	Nickel Cadmium
NPI	National Pollutant Inventory
NSW	New South Wales
OH&S	occupational health and safety
P&G	Procter & Gamble
PSI	Product Stewardship Institute
R2	Responsible Recycling Certification
RIS	Regulation Impact Statement
Scheme	National Television and Computer Product Stewardship Scheme
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities

SNAM	Societe Nouvelle D'Affinage des Metaux
SV	Sustainability Victoria
TAP	Technical Advisory Panel
TES-AMM	TES-AMM Australia Pty Ltd
TV or TVs	television(s)
UK	United Kingdom
ULABs	used lead acid batteries
US	United States (of America)
WALGA	Western Australia Local Government Association
WTP	willingness to pay
~	approximately

EXECUTIVE SUMMARY

Sustainability Victoria (SV) commissioned Martin Stewardship & Management Strategies Pty Ltd (MS2) to develop the public policy and business case for battery product stewardship in Australia. The project has been conducted in partnership with the Australian Battery Recycling Initiative (ABRI) and the Global Product Stewardship Council (GlobalPSC) to draw upon lessons from overseas best practice and tailor these to Australian conditions.

The scope of batteries covered is consistent with that used by ABRI in their submission[1] to all Australian governments seeking regulation under Australia's *Product Stewardship Act 2011* (the Act) - handheld batteries of up to around 1kg regardless of type. Used lead acid batteries are excluded due to strong existing recovery rates and the need to separate these from other battery chemistries.

It has been estimated that less than 5% of the handheld batteries currently sold in Australia are recycled[2]. Several Australian recyclers sort batteries by chemistry type, however most recovered handheld batteries are currently exported for material reprocessing. Recyclers interviewed for this study felt that recovered volumes are close to the minimum required for domestic reprocessing of lithium ion batteries to be commercially viable. Other reprocessing technologies could be viable given sufficient supply. The lithium and cobalt recovered from lithium ion battery recycling are key raw materials for battery producers.

Virtually all stakeholders consulted expressed support for product stewardship for handheld batteries in Australia. Stakeholders consulted that run battery programs, especially those overseas, highlight that a co-regulatory or regulatory approach may be the only means of gaining the participation of the large battery manufacturers and avoiding the 'free rider' problem that undercuts the commercial viability of voluntary product stewardship efforts.

Principal battery manufacturers consulted, representing Energizer and Duracell and accounting for approximately 70% of the Australian market[3], expressed support for the environmental objectives of product stewardship for batteries and pointed out that hazardous materials had been reduced in handheld batteries over the past few decades. Their support for specific product stewardship approaches was, however, conditional upon the approaches yielding a net life-cycle benefit and addressing the 'free rider' problem. These battery manufacturers also reinforced that the current lack of recycling infrastructure in Australia affects the business case for battery stewardship.

Handheld batteries satisfy the objects and criteria of the Act for designating products potentially subject to product stewardship. Key considerations include potential to significantly reduce impacts that the products have on the environment, presence of hazardous substances in the products and potential to significantly increase the conservation of materials used and resource recovery. In addition, various state and local governments expressed support for a nationally consistent approach to batteries based on co-regulatory product stewardship.

Australia's existing National Television and Computer Recycling Scheme (the Scheme) provides useful insight in developing a national approach to battery stewardship. A battery program should ideally be consistent with the Scheme and could enhance the Scheme by improving economies of scale and simplifying education efforts if the programs are effectively integrated. Approved co-regulatory arrangements under the Scheme already receive large quantities of batteries in their collections.

Information on availability of battery recycling is consistently sought by consumers wanting information on recycling specific products. Several retailers already operate battery collections, even though they are seen as a net cost, as a means of providing a service to consumers and increasing foot traffic to their stores. Any potential national approach for batteries should engage these retailers to gain insight

from their experience and to ensure that these retailers are not disadvantaged for being early promoters of battery recycling.

Although there would likely be a range of options available, for the purposes of this report the following options have been developed:

- **Option 1** – National Voluntary Battery Stewardship under the Act
- **Option 2** – National Battery Covenant
- **Option 3** – Co-regulation of batteries under the Act
- **Option 4** – Battery Extended Producer Responsibility (EPR)

Whilst Options 1 and 2 would provide considerable flexibility in delivering program results, results of both would likely be compromised without the support of all major brand owners and importers (collectively referred to as producers). These self-regulatory and quasi-regulatory approaches place a disproportionate financial burden on early adopters whilst allowing other non-active companies ('free riders') to benefit from increased product recovery without providing appropriate financial contributions to battery recovery efforts.

Co-regulatory and regulatory approaches under Options 3 and 4 would designate liable parties and impose minimum requirements in order to address the 'free rider' problem. A distinction between the two approaches is that Option 4 would be more prescriptive about components such as specific practices to be followed and funding models. Option 4 could also designate specific fees or payments in regulations.

Option 4 would likely prove overly prescriptive for Australian circumstances, resulting in unanticipated consequences or unnecessarily high program costs. Full EPR does not appear warranted at this time, and would not be consistent with Australia's approach to promoting voluntary and co-regulatory approaches.

Based on initial analysis, Option 3 would likely prove the most balanced approach, increasing battery recovery while minimising the impacts of 'free riders'. A co-regulatory approach provides the necessary regulatory underpinning to ensure that liable parties are held responsible in proportion to their impacts. Key performance requirements including recovery and convenience targets could be incorporated, yet stakeholders would have a variety of options available for delivering program results and minimising costs.

The following recommendations are based on project research and stakeholder consultations:

- **Recommendation 1** - Support including handheld batteries in the 'product priority list' for the Act (Clause 108A)
- **Recommendation 2** - Support producer responsibility for program operation and financing
- **Recommendation 3** - Engage retailers currently collecting batteries in the development of any potential national approach
- **Recommendation 4** - Ensure that battery recycling is convenient and accessible for consumers
- **Recommendation 5 -** Ensure verifiable public reporting of program results
- **Recommendation 6** - Ensure that program parameters are clearly defined before setting any program targets.

INTRODUCTION

SV commissioned MS2 to develop the public policy and business case for handheld battery product stewardship in Australia. The project has been conducted in partnership with ABRI[4] and GlobalPSC[5] to draw upon the experience of organisations already involved in recycling in Australia as well as lessons from overseas best practice.

The scope of batteries covered is consistent with that used by ABRI in their submission[6] to all Australian governments seeking regulation under the Act - handheld batteries of up to around 1kg regardless of type. Used lead acid batteries are excluded due to strong existing recovery rates and the need to separate these from other battery chemistries. Appendix A provides detail on material composition by chemistry type for primary/single use (Table A-1) and secondary/rechargeable (Table A-2) batteries.

Less than 5% of the 12,000 tonnes of domestic batteries that require disposal in Australia annually are recycled.[7] All handheld batteries consumed in Australia are imported. In order to progress towards a shared responsibility approach to batteries at end-of-life, gaining the support of producers[8] is essential.

The background paper and report have been developed and drafted to provide the foundations for a Regulation Impact Statement (RIS) to assist in potential adoption as a national co-regulatory or regulatory approach. Key features of a RIS include problem statements, identification of a range of options (including Australia-specific options for doing nothing as well as voluntary, co-regulatory and regulatory approaches) to address the problem statements, indicative analysis on the potential implementation of each identified option and recommendations for further action.

METHODOLOGY

MS2 consulted with a wide range of stakeholders (listed in Appendix B) representing manufacturers, retailers, industry associations, reprocessors and environmental advocacy organisations. Organisations that were contacted on multiple occasions (including a combination of phone and email contact) but did not provide formal responses are also listed in Appendix B.

Several representatives of organisations targeted for consultations agreed to be interviewed as long as views were not specifically attributed to their organisations and/or their organisations were not listed as having provided formal views for this project. To gain their insight and given the high consistency of stakeholder views, stakeholder views have been described generally unless a specific stakeholder is named.

The GlobalPSC provided insight from battery programs in Belgium (BEBAT), North America (Call2Recycle, Stewardship Ontario and Waste Diversion Ontario) and Switzerland (INOBAT). ABRI and SV were consulted throughout the project.

The study also built on the outcomes of a stakeholder workshop convened by SV in April 2012 (described below; attendees listed in Appendix C).

The support and insights of all those that provided information are greatly appreciated.

MS2 has included in this report, key features of a consultation RIS in order to facilitate possible RIS development. Council of Australian Governments (COAG) principles for best practice regulation[9] have also been considered in its development. Key features include:

- analysis of alternative collection systems (description/costs/benefits)

    - currently in place in Australia
    - best practice examples in other countries
- analysis of alternative recycling programs including
    - current end markets for Australian batteries
    - best practice examples in other countries
- recommendations for a national collection system in Australia

Additional options and variants of the options for stewardship program delivery have been examined to conform to COAG principles for best-practice regulation. This is necessary to address COAG requirements: consideration of a range of feasible policy options, not restricting competition unless various criteria are satisfied, ensuring that regulation remains relevant and effective over time, consulting effectively with affected key stakeholders at all stages of the regulatory cycle and ensuring that government action is effective and proportional to the issue being addressed.

Objects and criteria under the Act have also been incorporated to more effectively examine potential co-regulatory or regulatory options.

VISION/OBJECTIVES OF A NATIONAL PROGRAM

In August 2012, SV convened a workshop among key battery stakeholders to help outline a three-year strategy towards a national battery stewardship strategy. The workshop was facilitated by the ABRI and the GlobalPSC. Stakeholder organisations participating in the workshop are listed in Appendix C.

Following background presentations by SV, the ABRI and the GlobalPSC, stakeholders brainstormed around several key themes:

- Vision for the next three years
- Issues and opportunities of battery product stewardship in Australia
- Public policy and business case for battery product stewardship

Following these discussions, stakeholders developed and prioritised key themes that should underpin a national battery stewardship program. Results are summarised in Table 1.

Table 1: Stakeholder vision / objectives for a National Battery Stewardship Program by priority

1.	• Sustainable funding • Viable business case • Measurable performance
2.	• Stakeholder buy-in • Fit under the Act / regulatory frameworks • Levers to make happen
3.	• National approach with multiple options • Cost-effectiveness • Incorporation of existing stakeholders / programs • Range of business / collection models
Others	• Stakeholder value • Product stewardship organisation • Consumer education / engagement

This collective vision provides a framework around which options and analysis for a national battery stewardship program are structured in subsequent sections.

CURRENT STATUS OF RECYCLING IN AUSTRALIA

In early 2012, MS2 verified environment, quality and occupational health and safety (OH&S) practices of the battery recovery chain on behalf of Battery World, including documentation of material flows. These material flows have been refined and updated in conjunction with the ABRI for this project. First, background on battery consumption is provided for context.

Battery consumption and recycling rate

Handheld batteries are divided into two categories: *primary* (single use) and *secondary* (rechargeable). In 2009, primary batteries made up 23.6% of the global market. However, primary batteries represent a declining proportion of the market[10].

Significant growth is occurring in secondary batteries, driven primarily by growth in a broad range of portable electronics. Secondary batteries as a percent of the global market are expected to increase from 76.4% in 2009 to 82.6% in 2015[11]. Lithium-ion batteries dominate the growth in secondary batteries, as sales globally have increased from US$3 billion in 2000 to US$11 billion in 2012[12].

In 2010 it was estimated that approximately (~) 264 million handheld batteries (~12,000 tonnes worth of material) reach the end of their useful life each year in Australia. An estimated 183 million handheld batteries (~8,000 tonnes) are disposed of at landfill and less than 5% of end of life (EOL) batteries are recycled. The balance includes 'informal stockpiling', i.e., in EOL appliances, toys, phones and computers that haven't yet been disposed of. Batteries that are disposed of are most likely to end up in a putrescible landfill. Many batteries that are embedded in mobile phones and other electrical or electronic products also end up in landfill. Batteries entering municipal recycling programs are contaminants in the recycling process because they are not sorted and recovered.[13]

Consumer attitudes and behaviour

In a 2010 Planet Ark survey, 80% of consumers surveyed thought that EOL batteries should be recycled; 79% would be more likely to buy from battery companies that cover the cost of recycling their used batteries; 70% would definitely recycle batteries if recycling was convenient. When asked to choose a preferred method for recycling batteries, 42% of respondents would recycle through retail drop-off and 31% would prefer to put batteries in their council-provided kerbside recycling bin.[14] Batteries also rate consistently high in requests to Planet Ark for information about recycling products.

Collection programs

Organisations such as MRI, Close the Loop and SITA Australia collect batteries from organisations and councils for recycling. Retailers including Battery World, IKEA and ALDI provide a free drop-off service for their customers. Bunnings, Coles, Officeworks and some independent retailers participate in Batteryback, the Victorian state government-funded domestic recycling program in Melbourne.[15]

Since 2007, Battery World has progressively rolled out a used battery collection service to each of its 78 stores. ALDI's national battery collection program commenced in October 2012.

Whilst several councils provide free drop-off services for batteries, the strongest local government support for battery recycling is through the Western Australia Local Government Association (WALGA), where councils provide ~150 drop-off points that are free to consumers due to financial support from the state government. WALGA has indicated that batteries cost $2-4/kg to recycle, which includes transport and recycling costs, but may not include in-kind collection costs borne by councils[16].

Mobile phone lithium-ion batteries are collected in conjunction with mobile phones and recycled through MobileMuster[17], the Australian Mobile Telecommunications Association's official recycling program.

Intermediate processing

The viability of battery recycling depends on the chemical constitution of the batteries. In Australia, intermediate processors such as TES-AMM and MRI sort batteries by chemistry type and package the batteries for export or local processing, as described below.

There are three principal international certification programs to help ensure that electronic recycling activities are conducted in an appropriate manner - Responsible Recycling[18] (R2), e-Stewards[19] and WEELABEX[20]. TES-AMM's plants in Brisbane and Melbourne are certified to R2 standards, as is the Sims Recycling Solutions facility in Sydney. These facilities would all receive batteries as part of their collection and processing of electronics. TES-AMM's Singapore plant, which receives lithium batteries from TES-AMM's collections in Australia, is also R2 certified.[21] No Australian recyclers are certified to e-Stewards® or WEELABEX.

Local reprocessing

Primary alkaline and carbon zinc batteries were recycled at AusZinc[22] in Port Kembla, NSW, as part of their zinc operations through their AusBatt[23] Recycling program. Zinc and manganese dioxide were recovered. However, AusZinc discontinued these operations at the end of 2012 due to a change in business focus. As a result, from 2013 all handheld batteries (with the exception of sealed lead acid and some mercury and silver oxide batteries) will be exported for recycling.

CMA Ecocycle (CMA) is Australia's only Environmental Protection Authority (EPA)-licensed mercury recycling company[24]. CMA reprocesses mercury button cell and silver oxide batteries in Australia. Other handheld battery types are sorted by CMA and exported for recycling.[25]

Export for reprocessing

As there is no reprocessing capacity for them in Australia, rechargeable nickel metal hydride secondary batteries are also shipped overseas under license for recycling, mainly to Kobar Limited (KOBAR) in Korea but also to Societe Nouvelle D'Affinage des Metaux (SNAM) in France and Umicore in Belgium, for reprocessing. Materials recovered are primarily ferro-nickel and rare earth metals.

Nickel cadmium (NiCd) batteries exported under license are also shipped to KOBAR and SNAM for reprocessing. Ferro-nickel and cadmium are the principal materials recovered.

TES-AMM sorts and packs lithium-ion batteries from collections in Australia and export the batteries to their Singapore plant for metal extraction. Other intermediate processors export lithium ion batteries under license to SNAM and to Umicore. Lithium and cobalt are the principal materials recovered. Both TES-AMM and MRI are considering installing lithium processing plants in Australia if sufficient volumes of lithium batteries are available domestically to justify the investment.

At the present time, battery recycling (with the exception of lead acid, mercury button and silver oxide batteries) requires a fee for service. This is because the value of the recovered materials (such as zinc, manganese, steel and cadmium) is not sufficient to cover the costs of collection and reprocessing. By itself, battery recycling therefore represents a net cost to those offering battery collections in Australia and opportunities for consumers to participate are limited.

BEST PRACTICE EXAMPLES FROM OTHER COUNTRIES

An objective of this project was to learn from best practice examples in other countries. Several European and North American programs provide the most relevant information for Australia and are described in the following sections. For this component, MS2 drew upon previous analysis and personal interviews with the programs involved conducted by MS2 and the GlobalPSC. Analysis was updated and refined to reflect the current situation for each overseas example.

European Commission Directive 2006/66/EC on Batteries and Accumulators

The European Commission Directive 2006/66/EC on Batteries and Accumulators (the Batteries Directive)[26] has been the primary driver for handheld batteries in Europe and represents full extended producer responsibility (EPR).

The Batteries Directive defines 'portable battery or accumulator' as "any battery button cell, battery pack or accumulator that: (a) is sealed; and (b) can be hand-carried; and (c) is neither an industrial battery or accumulator nor an automotive battery or accumulator."

The original Batteries Directive took effect in 1991, and has been repealed and modified since. Since September 2008, the Batteries Directive prohibits placing batteries and accumulators (with a few exceptions) on the market with a certain mercury or cadmium content:

- containing more than 0.0005% by weight of mercury (except for button cells, which must have a mercury content of less than 2% by weight); and
- with a cadmium content by weight of more than 0.002% (except for portable batteries and accumulators for use in emergency and alarm systems, medical equipment or cordless power

tools).

The Batteries Directive also establishes rules for the collection, recycling, treatment and disposal of batteries and accumulators. From September 2009, batteries and accumulators must be treated and recycled using the best available techniques. Recycling must exclude energy recovery.

From September 2011 targets for recycling of battery and accumulator content include recycling:

- at least 65% by average weight, including recycling of the lead content to the highest degree that is technically feasible;
- 75% by average weight of nickel-cadmium batteries and accumulators, including recycling of the lead content to the highest degree that is technically feasible; and
- at least 50% by average weight of other battery and accumulator waste.

The overall target set by the Batteries Directive is that 25% of all waste portable batteries should be collected by 26 September 2012 and 45% collected by 26 September 2016.

If there is no viable end market, or if a detailed assessment of environmental, economic and social impact concludes that recycling is not the best solution, Member States may dispose of batteries and accumulators containing cadmium, mercury or lead in landfills or underground storage. While the European Union (EU) does not impose landfill bans, a few Member States do. Few, if any, EU landfill bans would apply to batteries.

BEBAT (Belgium)

A legal debate on how to regulate the use, collection and recycling of batteries in order to minimise pollution led to voluntary agreements between the Belgian battery industry and the government in 1988 and 1990 that aimed at reducing or eliminating mercury content in batteries. Batteries have been subject to an Eco-Tax Law since 1993, but there is an exemption for any battery system that achieves certain collection targets.

Under threat of the implementation of the eco-tax, industry agreed to include all portable batteries (not just those containing mercury) under a new voluntary agreement and in August 1995 set up not-for-profit organisation BEBAT a.s.b.l.[27] to organise battery collection and treatment. BEBAT became operational in January 1996. The agreement with the three regional environment agencies regulating BEBAT's operations was signed in June 1997.

All three regions - Flemish, Walloon and Brussels Capital – introduced mandatory take-back for some batteries between 1999 and 2002. By late 2010, all three regions had amended their Regional Decrees to bring them in line with the Battery Directive.

The Belgian Regional Decrees are complemented by Environmental Agreements between the three regional governments and the sector associations, which stipulate operational details for the collective batteries management system. The agreements have 3-5 years duration and the first agreements have all expired. So far only the Flemish Region has signed a new agreement under the amended Decree. It confirms BEBAT as the system for portable and - new under the amendment - industrial batteries from 2011.

Producers must pay an eco-tax of Euros (EUR) 0.5 (currently ~$0.59) for all batteries placed on the market unless they achieve a collection rate of 45% from 2010 and 50% from 2012 through an agreed collective or individual recycling system.

BEBAT is financed by a fee – set by the Government – of ~$0.21 per battery put on the market, or about one-third of the eco-tax. Around 1,300 battery producers and importers are registered with BEBAT, which services a population of ~11 million as of 2011.

The BEBAT collection system has made it convenient for consumers to return their spent batteries by providing a dense network of collection facilities (Figure 1). BEBAT also spends heavily on awareness programs. Relatively heavy investment in collection facilities and communications has enabled Belgium to achieve a higher collection rate for batteries than other EU Member States have managed.

Figure 1: BEBAT collection stands

BEBAT now has more than 22,450 collection points throughout Belgium, notably at retailers, municipal collection sites, schools and the drop-off centres widely available for collecting beverage containers and other products.

Being a mature battery collection system, return rates of around 50% have been consistently achieved over the past decade. The 2012 collection rate is estimated at 49%.

INOBAT (Switzerland)

A similar program to BEBAT is run by INOBAT[28] in Switzerland. Both programs focus on providing convenient collections for recycling and use a range of collection drop-offs, satchels and education campaigns to facilitate collections. The GlobalPSC has posted a video about INOBAT in English[29].

Figure 2: INOBAT ads translating as "apology accepted. All others need to bring in their batteries"
Source: INOBAT

Although Switzerland is not a member of the EU, it has adopted broadly similar rules on batteries. Legal take-back requirements have been in force since 1986 and voluntary financing by producers began in 1991. In April 2001, the so-called ORRChem Ordinance made the fee mandatory for portable batteries. Revisions to ORRChem that took effect in February 2011 resulted in alignment with the Batteries Directive.

Producers of all battery types must report volumes put on the market to collective organisation INOBAT and pay an Advance Recycling Fee (ARF). Producers of electrical and electronic equipment

with embedded batteries report through the e-waste systems SENS and SWICO. Battery retailers must take back waste batteries from consumers for transfer to INOBAT. Local authorities do not have collection obligations.

Fees vary by battery sizes and chemistries. The amount of the ARF is set by legislation at Swiss Francs (CHF) 3.20 (roughly on parity with $) per kg for portable batteries and CHF 1 per unit for lead batteries. The price that INOBAT must pay to the only recycler, BATREC, is also set by legislation at CHF 4,400 per tonne.

Waste batteries are collected at 11,000 obligated retailers and voluntary collection points (these voluntary collection points are mostly run by municipalities). The Swiss population was ~7.9 million in 2011. Since the late nineties, INOBAT has maintained a return rate of between 65% and 70% for portable batteries.

Meanwhile a 2010 revision of the Swiss Ordinance, in force from February 2011, aligned it with the Batteries Directive and extended reporting and financing obligations to all battery types and weights. INOBAT has been designated by the Government to manage the ARF for the period 2011-2015: it collects producers' data and is authorised to grant exemptions from the financing obligation.

G&P Batteries Ltd (United Kingdom)

G&P Batteries Ltd (G&P) started more than 20 years ago by scrap merchants focused on used lead acid batteries.

The UK's requirements under the Batteries Directive took effect in 2010, with targets for collection as a proportion of batteries placed on the market. A 25% recovery target for 2012 was achieved in the UK. The target increases to 30% for 2013 and 45% for 2016. G&P estimate that without legislated targets, recovery rates for handheld batteries would only be in the order of 1-2%.[30]

Battery compliance schemes in the UK contract out collections, and G&P is a prominent contractor. G&P is contracted to all five battery compliance schemes, handling 100% of the recovered volumes from several of the schemes and less from the other compliance schemes.

One serious shortcoming in how the UK approach was implemented is that recovery targets were set before program definitions were established. This led to gaming of the system and having to define the scope of the Directive in a way that reflected the recovery that was already happening. UK definitions also initially defined batteries by class (e.g. automotive, industrial or portable) in a way that allowed used lead acid batteries (ULABs) for which demand was strong to count as portable batteries. As a result, early targets were met almost exclusively through ULABs rather than driving an increase in portable battery recovery. Even though the definitions have now been modified, targets are likely to be met over the next several years through processing of stockpiled ULABs.[31]

G&P also highlight how establishing targets can bring about certain outcomes; for example, as compliance schemes seek to minimise their costs, they will recover only the amount of material necessary to achieve their targets within a certain period of time.[32]

Call2Recycle (North America)

Founded in 1994, Call2Recycle is operated by a non-profit organisation funded by product manufacturers committed to environmentally-sound recycling of rechargeable batteries and mobile phones. These manufacturers place a recycling symbol on their rechargeable products and batteries, informing users that they are recyclable.

Call2Recycle is the only rechargeable battery and mobile phone collection program provided at no cost to consumers in North America. Call2Recycle is also somewhat unique in being both a product stewardship organisation (the first in North America) and the service provider. Most organisations separate these functions. Canadian provinces using Call2Recycle to implement their regulated battery product stewardship/EPR programs include British Columbia, Manitoba and Quebec[a]. Ontario, which has a different regulatory framework and funding model, also uses Call2Recycle.

Since 1996 Call2Recycle has diverted over 31,750 tonnes of rechargeable batteries from the solid waste stream and established a network of 30,000 collection sites throughout the US and Canada. Call2Recycle is the first program of its kind to receive R2 certification, as well as e-Steward certification from the Basel Action Network (BAN).

Figure 3: Call2Recycle promotional overview
Source: Call2Recycle

North American battery collections increased to 4,700 tonnes in 2012, up 16 percent from 2011 levels. The 11% statewide growth for California in 2012 came from the municipal and manufacturing sectors, which increased by 23% and 24%, respectively.[33]

Battery collections grew by 56% in Canada for 2012. The increase can be accredited in part to its program expansion in Quebec via RECYC-QUÉBEC, where Call2Recycle was selected by the provincial recycling authority RECYC-QUÉBEC to serve as the official battery recycling program for the province. As of July 2012, Call2Recycle began accepting single-use household batteries for recycling in support of the provincial EPR regulation. As a result, 2012 collections in Quebec rose by 357% over 2011.[34]

Although established and operated as a voluntary, industry-led program since 1994, Call2Recycle has recently begun actively advocating EPR for batteries in the US in order to address the 'free rider' problem of companies benefitting from the recovery program without contributing financially.[35] Recycling rates in the US and Canada are unknown as the programs recovering the batteries often do not have access to the commercially sensitive sales data necessary to accurately make such determinations.

[a] Nova Scotia, Prince Edward Island and Alberta also have regulated battery product stewardship programs.

Overview

A summary of key aspects of these programs is provided in Table 2.

Table 2: Overview of international battery programs

Country	Regulation	Stewardship program	Scope (handheld batteries)	Recycling rate achieved
European Union	EU Battery Directive (2006/66/EC)	Compliance programs by country	Sealed; can be hand carried; neither automotive nor industrial.	Target is 25% by 2012 and 45% by 2016
United Kingdom[36]	Waste Batteries and Accumulators Regulations 2009	Five battery compliance schemes (G&P Batteries is a contractor)	Sealed; can be hand carried; neither automotive nor industrial.	28% in 2012[37]. Target is 30% by 2013 and 45% by 2016.
Belgium	Eco-tax law 1993	BEBAT	Sealed; can be hand carried; neither automotive nor industrial.	49% in 2012
Switzerland	ORRChem Ordinance as amended 2011	INOBAT	Sealed; can be hand carried; neither automotive nor industrial.	65-70% each year since the late 1990's
North America[38]	Voluntary in most jurisdictions	Call2Recycle	In the US, any rechargeable battery weighing up to 11 pounds. In Canada, collect any household battery (including alkaline) in British Columbia, Manitoba, and Quebec provinces.	Not available

PUBLIC POLICY CASE FOR BATTERY STEWARDSHIP

There is strong public policy case for product stewardship of batteries. This is based on a range of benefits that will be achieved by expanding recycling:

- batteries contain substances that can be hazardous if released into the environment;
- conserving the value of the metals (including rare earth metals) and other materials that currently end up in landfill;
- reduced environmental impacts from current landfill and disposal practices;
- potential to reduce contamination of other product recovery programs;
- reduced environmental impacts from raw material extraction in Australia and overseas; and
- strong consumer and jurisdictional support for seeing batteries managed and recycled responsibly.

The value of the recovered materials (such as zinc, manganese, steel and cadmium) in batteries is not sufficient to cover the costs of collection and reprocessing. By itself, battery recycling therefore represents a net cost to those providing battery collections in Australia for their residents, customers or employees, and opportunities for most consumers to participate are limited.

According to SV's Batteryback data, brands sold by the two companies that dominate the battery market - Energizer and Duracell (which is owned by Procter & Gamble (P&G)) - make up approximately 70% of the used batteries collected through Batteryback. Both companies have been active in R&D and stakeholder engagement in the US with the aim of establishing a voluntary battery recycling program there from 2013.

When consulted for this project, Energizer and P&G both expressed support for the environmental objectives of product stewardship for batteries and pointed out that hazardous materials had been reduced in handheld batteries over the past few decades. Their support for specific product stewardship approaches was, however, conditional upon the approaches yielding a net life-cycle benefit and addressing the 'free rider' problem.

Other stakeholders consulted for this project overwhelmingly endorsed a national approach to battery product stewardship in Australia, with a clear preference for a co-regulatory approach as an important means of getting engagement from all liable parties, producers in particular. P&G added further weight to this argument. When asked whether their organisation would support a voluntary, co-regulatory or regulatory approach for batteries in Australia, P&G indicated in-principle support but noted that enabling legislation creating a level playing field (as in Europe and Canada) was essential to address free riders.

The following sections examine the public policy case for a national battery stewardship program, including issues raised by Energizer and P&G and from stakeholders participating in SV's strategy workshop.

Objects and criteria under the National Waste Policy and Product Stewardship Act 2011

In Australia, the National Waste Policy and the Act (in particular the Act's objects and criteria) provide an appropriate framework for considering whether a compelling public policy case can be made for regulatory intervention with batteries.

The National Waste Policy has been endorsed by all Australian governments, through both the Environment Protection and Heritage Council (November 2009) and COAG (August 2010). Developing nationally consistent product stewardship schemes was a primary driver for the policy. The policy's emphasis is on providing a national framework to support voluntary, co-regulatory and regulatory product stewardship and EPR schemes.

The Act, which took effect in August 2011, provides the framework envisioned under the National Waste Policy.

Section 4 of the Act states that,

> *"(1) It is an object of this Act to reduce the impact:*
>
> *(a) that products have on the environment, throughout their lives; and*
>
> *(b) that substances contained in products have on the environment, and on the health and safety of human beings, throughout the lives of those products.*
>
> *(2) It is Parliament's intention that this object be achieved by encouraging or requiring manufacturers, importers, distributors and other persons to take responsibility for those products, including by*
>
> *taking action that relates to the following:*
>
> *(a) avoiding generating waste from products;*
>
> *(b) reducing or eliminating the amount of waste from products to be disposed of;*
>
> *(c) reducing or eliminating hazardous substances in products and in waste from products;*
>
> *(d) managing waste from products as a resource;*
>
> *(e) ensuring that products and waste from products are reused, recycled, recovered, treated and disposed of in a safe, scientific and environmentally sound way.*
>
> *Other objects*
>
> *(3) The following are also objects of this Act:*

(a) to contribute to Australia meeting its international obligations concerning the impacts referred to in subsection (1);
(b) to contribute to reducing the amount of greenhouse gases emitted, energy used and water consumed in connection with products and waste from products."

Section 5 of the Act contains product stewardship criteria that are satisfied in relation to a class of products if:

a) *the products are in a national market*
b) *at least one of the following applies in relation to the products in the class:*
   i. *the products contain hazardous substances;*
   ii. *there is the potential to significantly increase the conservation of materials used in the products, or the recovery of resources (including materials and energy) from waste from the products;*
   iii. *there is the potential to significantly reduce the impact that the products have on the environment, or that substances in the products have on the environment, or on the health or safety of human beings.*

Battery product stewardship satisfies all of the product stewardship criteria, as described in the following sections. As the objects of the Act are encompassed in the criteria and discussed throughout this report, they are not elaborated separately.

The products are in a national market

Batteries are clearly in a national market within Australia. In addition to batteries being sold at a national level, battery recovery and reprocessing frequently involves transportation across jurisdictional boundaries.

The products contain hazardous substances

Heavy metals in batteries can be toxic to human health and/or have eco-toxicity impacts in most forms or quantities. Lead, mercury and cadmium are the most toxic of the heavy metals in batteries; however, other metals such as zinc can also be a concern if they leach into water or soil. Whilst not all of these materials are present in all battery types, consumers do not normally distinguish between battery chemistry types.

Cadmium, lead and mercury (and their compounds) were ranked at 6, 11 and 35, respectively, out of approximately 400 substances for priority reporting under the National Pollutant Inventory (NPI)[39]. Alkaline batteries are considered to be a hazardous waste under the *Hazardous Waste (Regulation of Exports and Imports) Act 1989* and therefore (like all batteries) require an export permit. This is because the potassium hydroxide electrolyte is highly corrosive and manganese is a neurotoxin[40].

The US EPA has also expressed concern about the neurotoxicity and developmental toxicity impacts of lithium[41].

There is the potential to significantly increase the conservation of materials used in the products, or the recovery of resources (including materials and energy) from waste from the products

The only recent mass balance data is from ABRI, which estimated that ~264 million handheld batteries (around 12,000 tonnes of material) reach the end of their useful life each year[42]. Approximately 183 million (8,000 tonnes) are disposed of at landfill and less than 5% are recycled[43]. The balance includes 'informal stockpiling', i.e., in EOL appliances, toys, phones, computers etc. that haven't yet been disposed of.

Handheld batteries contain valuable metals, including lithium, zinc, manganese, steel, cadmium, lead and rare earth metals. Amongst the most valuable are cobalt, lithium and cadmium. Responsible collection and recycling can help conserve these materials, resulting in potential economic savings that remain to be fully quantified. Increased collection volumes could help make domestic reprocessing more viable.

Recent research[44] shows that ore grades are in terminal decline for a range of metals, including nickel and lead-zinc-silver ores. Lithium, which is an essential raw material for the latest generation of consumer electronics, is relatively rare. Demand will continue to increase due to increased use of lithium ion batteries in electric vehicles, and this makes recycling even more important from an economic perspective. Figure 4 shows estimates for lithium demand and supply in the US.

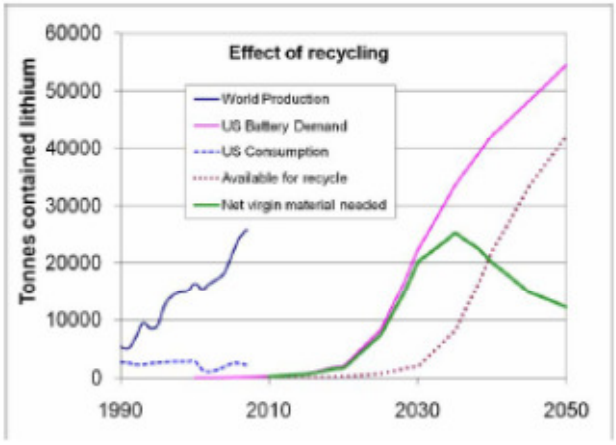

Figure 4: Lithium demand and availability from recycling in the US[45]

'Urban mining' of such materials from EOL products can help to address material scarcity and reduce overall environmental impacts, particularly from material extraction and initial processing.

Many batteries are also embedded in mobile phones and other electrical or electronic products. This creates both problems and opportunities. The quantity of embedded batteries entering Australia would be difficult to determine. BEBAT had planned for recovery of certain volumes of batteries based on market data, yet actual collections were one-third more than anticipated due to embedded batteries, including those in products such as toys.

Embedded batteries are not readily accessible by consumers to return for recovery and the wide variety of products containing embedded batteries could prove a barrier to recovery. Embedded batteries in TVs and computers are the specific responsibility of liable parties under the National Television and Computer Recycling Scheme (Scheme), which is distinct from batteries that can be readily removed from their products by consumers.

There is the potential to significantly reduce the impact that the products have on the environment, or that substances in the products have on the environment, or on the health or safety of human beings

Battery product stewardship can reduce the risk of environmental and health impacts of certain heavy metals if disposed of in landfill or as contaminants in other recovery streams, e.g. composting. Removal of hazardous wastes, including batteries, from general waste would support the recovery of organic materials through facilities that use alternative waste technologies (AWT) such as anaerobic digestion and composting. Diversion of residual waste from landfill to AWTs is becoming a higher priority for all governments under the National Waste Policy. These facilities recover organic materials

from residual household waste and need to strictly control potential contamination from hazardous household products such as batteries.

Reduced environmental impacts of extraction and processing, especially in China and Korea where many raw materials are initially sourced and where many environmental management practices are relatively poor, could also result.

A 2011 study using three life-cycle assessment (LCA) methods[46] by researchers at the Massachusetts Institute of Technology (MIT) determined that production accounted for an overwhelming proportion of environmental impacts across various parameters (Table 3). In the report, 'Production' includes mining and refining of raw materials, battery manufacture, distribution and packaging while 'End of Life' includes collection, transportation, processing and recovery of materials for use or disposal through landfill.

Table 3: Life cycle impact of 1kg weighted average alkaline battery, using three LCA methods

PHASE	Cumulative Energy Demand (CED)	Global Warming Potential (GWP)	Damage to Human Health	Ecosystem Quality	Damage to Resources
% Production contribution	96%	77%	92%	71%	96%
% End-of-Life contribution	4%	13%	8%	29%	4%

Source: MIT 2011

The MIT study concluded that the environmental impacts of batteries over their life cycle are primarily from the production of raw materials, with production of manganese dioxide, zinc and steel having the highest impacts. The benefits of recycling can be optimised by recovering more than zinc for its metal value (i.e. replacing virgin material). The environmental impacts of the collection stage depend on whether consumers need to make a dedicated transport journey. The scenario with the lowest impact was the addition of batteries to an existing kerbside collection system. Municipal and retail drop-off systems were also modelled.

An earlier UK study[47] considered EOL options for all portable batteries including alkaline, zinc carbon, lithium, nickel cadmium, nickel metal hydride, lead acid and other battery chemistries. Unlike the MIT research, the UK study considered the financial costs of different scenarios as well as their environmental impacts. The study concluded that increasing recycling is beneficial to the environment due to the recovery of metals and avoidance of virgin metal production.

Raw materials such as steel, manganese and zinc are mined and processed in Australia, shipped overseas for production and are (presumably) shipped back in finished battery products. To the extent that Australian raw materials are used by battery manufacturers overseas, resource extraction benefits (including reduced land degradation, waste and energy use) may occur in Australia as well.

ABRI also note that recovery and recycling of batteries may reduce pollution from landfills because as batteries start to break down in landfill, particularly in an acidic environment, heavy metals can leach into surface and groundwater. This is especially true for the 15% of large landfills and 65% of medium-sized landfills in Australia that are unlined.[48]

Other policy considerations

Consumer willingness to pay

An additional consideration that factors into the decision-making process is consumer willingness to pay (WTP). Although the Planet Ark research cited earlier indicates consumer WTP, fuller

quantification of consumer WTP is generally associated with development of a consultation or decision RIS. Specific data on WTP for batteries in Australia is not available at this time.

Savings to state and local governments

Shifting waste management and recycling costs back to the producers and consumers of particular products has long been a primary objective of EPR and product stewardship.

The US-based Product Stewardship Institute (PSI) has estimated total financial benefit of EPR for primary/single-use and secondary/rechargeable batteries in the US as US$247 million and US$74 million, respectively, for 2010. These values represent current costs in the US to manage these products and would represent benefits to public budgets if they were managed through producer responsibility. They have been calculated by combining:

- actual costs, which would be the direct financial savings to a local government of implementing an EPR program; and
- service benefits, which is the value of the added benefits a municipality would receive if EPR were to take hold.

Applying the PSI per capita savings values of US$0.80 and US$0.24 to Australia's 2012 population of 21,727,158 provides indicative potential financial benefits in Australia of $16.1 million and $4.8 million for primary and secondary batteries, respectively, at current exchange rates.

WALGA has indicated a cost of $2-4/kg to recycle batteries from Perth. This value includes costs to transport and recycle batteries, but not in-kind contributions by councils for providing collection facilities. States funding household hazardous waste (HHW) collections, primarily New South Wales (NSW) and Victoria, report the costs of managing batteries as part of these programs. Since 2007, Victoria has spent ~$100,000 across eight locations for battery collection, processing and reporting. Victorian costs in 2010 were ~$43,300 for Batteryback and HHW collections for domestic batteries; costs will increase significantly as the program expands to 40 collection points from 2013.

Feedback from jurisdictions

In late 2012, ABRI received strong support for battery product stewardship from most Australian jurisdictions. A submission outlining the case for regulation and seeking government support was sent to all relevant environment ministers in November 2012. ABRI's submission, and therefore the responses from ministers, only applied to handheld batteries. Various jurisdictions had also previously been on record as supporting battery product stewardship.

In their letters to ABRI the Victorian, NSW and South Australian Governments supported inclusion of handheld batteries in the priority product list under the Act. Victoria has identified battery stewardship as a priority for action in its environmental agency's latest 3-year business plan and is investing significant funds to promote recycling and industry engagement. The Australian Capital Territory (ACT) Government noted in their letter to ABRI that it "supports national approaches to manage end-of-life batteries", including product stewardship. Western Australia reinforced the substantial cost to manage batteries properly and the importance of keeping batteries out of the waste stream and directing them to recycling where practicable. The Queensland and Tasmanian ministers deferred to the national process for prioritising products, and Queensland's minister noted that batteries could be included in a new state industry-led waste strategy.

In November 2012, Paul Caica, South Australia's then Minister for Sustainability, Environment and Conservation, wrote the following to ABRI:

> *"Handheld batteries contain valuable metals, including, lithium, zinc, manganese, steel, cadmium, lead and rare earth metals and there is potential to significantly increase the recovery of these non-renewable resources by recycling handheld batteries. Some batteries*

also contain heavy metals that can be toxic to human health and the environment if not managed responsibly at end of life.

In view of the above, I support the inclusion of handheld batteries in the priority product list for the Product Stewardship Act 2011."

In December 2012, Simon Corbell, the ACT's Minister for the Environment and Sustainable Development, wrote in his letter to ABRI:

"The ACT Government supports national approaches to manage end-of-life batteries, including the national product stewardship initiatives which could further improve the recovery and recycling of products such as TVs and computers, tyres and batteries."

The *Waste and Recycling in Australia* report[49] gave a 'very high' priority rating for NiCd batteries and a 'medium' rating for personal batteries in recommending prioritising products for attention in product stewardship or other programs to increase lifespan, reuse and recovery. In 2010, NSW proposed that batteries be a national priority waste and that industry EPR be accelerated. WALGA reports that local governments see need for urgent action on batteries[50].

The Australian Government is a signatory to the Basel Convention, which is an international treaty designed to reduce the movements of hazardous waste between nations, specifically to prevent transfer of hazardous waste from developed to less developed countries. Under the Basel Convention, Australia is required to ensure that the generation of hazardous and other wastes (including household wastes), within Australia is reduced to a minimum, taking into account social, technological and economic aspects; ensure adequate disposal facilities are available within Australia; control and reduce international movements of hazardous waste; and ensure that wastes are disposed of in an environmentally sound manner, which protects human health and the environment against any adverse effects of such wastes.

Some batteries contain mercury (e.g. mercuric oxide and other button cells) in small quantities. The Australian Government is likely to ratify the United Nation's Global Legally Binding Instrument on Mercury (the Minamata Convention), which be opened for signature in October 2013. This convention aims to reduce the use of mercury in products, including batteries, and to reduce mercury-containing waste.[51]

Addressing batteries through product stewardship would therefore contribute to Australia meeting its international obligations, which is an object under the Act.

BUSINESS CASE FOR BATTERY STEWARDSHIP

Making the business case for battery stewardship is more difficult than for the public policy case due to commercial sensitivities about program costs and benefits, as well as the distribution of potential costs and benefits between industry sectors. A variety of stakeholders provided background information for this report but did not wish to see such information made public. The following discussion is therefore qualitative rather than quantitative.

Voluntary participation in battery stewardship programs is linked to the business case for particular types of business. This will vary depending on the activity the business is involved in (e.g. manufacturing, importing, selling or recycling) as well as each company's policies and corporate strategy.

Producers

Producers have a vested interest in keeping their costs, and the costs that are ultimately passed on to consumers, to a minimum. This is essential to preserve or potentially expand their market share. However, relative costs and benefits to producers of product stewardship depend upon the particular approach applied and how producers respond.

Producers that support voluntary product stewardship see it as a means of bolstering corporate reputation while potentially avoiding more onerous regulations. Developing and implementing an industry-led product stewardship approach also allows producers to maintain a greater level of control, which potentially allows them to minimise their costs. This is a primary reason that Canadian paint producers developed their own stewardship programs for waste paint. Similarly, the U.S. paint industry accepted that the status quo was not adequate and industry players teamed up to seek resolution in a way that afforded producers the opportunity to run and manage their own programs.[52]

In a Planet Ark consumer survey, 80% of consumers surveyed thought that EOL batteries should be recycled and 79% said that they would be more likely to buy from battery producers that cover the cost of recycling their used batteries, so consumers may support producers that participate in product stewardship programs if they are made aware of those efforts.[53] Since batteries also rate consistently high in requests to Planet Ark for information about recycling products, consumer interest appears strong.

Although established and operated as a voluntary, industry-led program since 1994, Call2Recycle has recently begun actively advocating EPR for batteries in the US in order to address the 'free rider' problem of companies benefiting from the recovery program without contributing financially. The producers that fund Call2Recycle on a voluntary basis have been less willing to continue funding the program unless free riders are addressed effectively.

In Australia, support from Energizer and P&G for specific product stewardship approaches is conditional upon the approaches yielding a net life-cycle benefit and addressing the free rider problem. According to these producers, the current lack of recycling infrastructure in Australia limits the business case for battery stewardship through the lack of collection and processing capacity, the cost of exporting most batteries and the perception that landfilling is the only disposal/management option available within Australia. These companies also believe that the lack of recycling infrastructure in Australia affects the potential life-cycle costs and benefits of recycling through long-distance transport. However, there is conditional support from these companies for product stewardship under the right circumstances.

Companies such as Canon and Toshiba are actively advocating battery stewardship in Australia through their membership of ABRI.

Other key business considerations for producers are the availability and price of raw materials, so the effect of product stewardship on these considerations is worth examining. A 2010 study for the European Commission[54] examined critical raw materials for the EU. In the report, a given raw material was labelled 'critical' when the risks of supply shortage and their impacts on the economy are higher compared with most of the other raw materials. Two types of risks were considered: a) 'supply risk' that considers the political-economic stability of the producing countries, the level of concentration of production, the potential for substitution and the recycling rate; and b) the 'environmental country risk' that considers the risks that measures might be taken by countries with weak environmental performance in order to protect the environment that could, in turn, endanger the supply of raw materials to the EU.

Of relevance to battery producers, cobalt was specifically listed as a critical raw material. While not labelled as critical from a supply risk perspective, both lithium and manganese were seen as economically important with the potential to become critical in the future.

The report included recommendations "*that policy actions are undertaken to make recycling of raw materials or raw material-containing products more efficient, in particular by:*

- *mobilising End of Life products with critical raw materials for proper collection instead of stockpiling them in households (hibernating) or discarding them into landfill or incineration;*
- *improving overall organisation, logistics and efficiency of recycling chains focus on interfaces and system approach;*
- *preventing illegal exports of EOL products containing critical raw materials and increasing transparency in flow; and*
- *promoting research on system optimisation and recycling of technically-challenging products and substances".*

Battery product stewardship and recycling could help reduce supply chain risks associated with key raw materials including cobalt, lithium and manganese from lithium-ion, alkaline and lithium manganese dioxide batteries. More detailed analysis of supply chain impacts for battery raw materials is beyond the scope of this report.

Raw materials such as steel, manganese and zinc are mined and processed in Australia, shipped overseas for production and are shipped back as finished battery products. Whilst product stewardship would produce positive environmental benefits for these activities, potential financial costs and benefits of battery product stewardship on resource extraction and processing would need to be examined further in order to develop a fuller understanding of their impacts on producers. Producers did not specifically raise such concerns during consultations for this report.

Retailers

Retailers including Battery World, IKEA and ALDI currently provide free drop-off services for consumers. In Melbourne, Bunnings, Coles, Officeworks and some independent retailers participate in Batteryback, a Victorian government-funded domestic recycling program.[55]

Since 2007 Battery World has progressively rolled out battery recycling to each of its 78 stores. In various public forums Battery World has stated that the commercial benefits of their voluntary battery collections include:

- the point of differentiation that it provides from their competitors
- a compelling means of engaging consumers, schools and media.

According to Battery World the promotional benefits for the company are estimated at ~$1 million. These promotional benefits are believed to have resulted in increased foot traffic to Battery World stores. Battery World's Townsville store, which was the first to offer a battery collection program, was transformed from a marginally viable store to the highest grossing store for three consecutive years after implementing the recycling program.

ALDI's battery collection program commenced in October 2012. They have indicated that a primary reason for starting their battery collection program was to provide a service to consumers. It is too early to identify specific impacts and benefits of ALDI's program given limited implementation to date. In addition, ALDI made a number of changes to battery sales at the same time they started their program, so benefits directly attributable to ALDI's battery collections would be difficult to quantify.

Retail drop-off was the most popular collection option mentioned by consumers surveyed for Planet Ark, which appears to support the value of recycling programs to retailers.[56] A survey by Call2Recycle

found that over 50% of people who dropped batteries for recycling at a retail store in Canada or the US, stayed to shop for more than just a replacement item.[57]

Implementation of an industry-wide (producer-funded) battery stewardship program that included other retailers would remove a point of differentiation for the retailers that have initiated battery collections voluntarily. However, these industry leaders are also operating these programs at a net cost, while their competitors are not. These retailers may therefore receive a financial benefit whilst their competitors face additional costs.

Recyclers

Organisations such as MRI, CMA, Close the Loop and SITA Australia that collect batteries from organisations and councils for recycling, operate on a fee-for-service basis. The companies that sort and/or reprocess batteries from Australian collections should see direct financial benefits as collection volumes increase under an expanded battery product stewardship scheme.

Since most consumers do not differentiate between different battery chemistry types, it is expected that collection volumes for all handheld batteries would increase as a result of battery product stewardship. Given the positive values of batteries containing mercury and silver, organisations collecting these batteries and shipping them to CMA for recycling in reasonable quantities (~10-20kg) can receive direct payment from CMA[58].

A battery stewardship program should ideally be integrated or aligned with the Scheme for TVs and computers, and could enhance the Scheme by improving economies of scale and simplifying education efforts. Approved co-regulatory arrangements under the Scheme already receive some non-regulated batteries in their collections, so having these batteries specifically targeted could provide some benefits through financial return to the arrangements or reduced cost of disposing non-regulated batteries.

Increased collection volumes could justify the establishment of local reprocessing capacity. Both TES-AMM and MRI advised that they would consider installing a lithium processing plant in Australia if sufficient volumes of lithium batteries are available domestically to justify the investment.

The overseas reprocessor Recupel is profitably recycling 2,000-3,000 tonnes of batteries. MRI has publicly stated its interest in establishing a reprocessing facility in Australia if they could reliably source 60-80 tonnes per annum of lithium ion batteries and/or 800 tonnes per annum of alkaline batteries (less than 7% of EOL batteries). As reprocessing for virtually all handheld batteries is currently conducted overseas, even conducting initial processing in Australia should provide some economic and employment benefits.

Ideally, sufficiently large volumes of batteries recovered would allow multiple reprocessors using different technologies to be viable and compete.

Sufficient data is not currently publicly available to estimate the environmental and material values of resource conservation through battery product stewardship under various scenarios for increased recovery. Such information would provide greater clarity to the business case for battery stewardship in Australia.

Distribution of costs and benefits

Increased recovery volumes under a product stewardship scheme would likely reduce overall program costs (and hence costs to consumers), as higher volumes allow for proportionately lower transport and reprocessing costs. Experience from the MobileMuster program shows that air reply or satchel volumes reportedly range up to $15 per kg, while small boxes can cost $2 per kg and pallet loads can cost as little as $0.01 per kg to transport[59]. Controlling such program costs may prove critical to

encouraging battery producers in particular to become more actively engaged in making product stewardship approaches viable in Australia.

Recycling costs will also be compared against disposal costs in the absence of specific regulatory requirements. For example, some waste transporters will dispose of batteries in concrete for as little as $0.50 per kg, so recycling may seem expensive in comparison. Some stakeholders felt that with sufficient recovery volumes, comprehensive battery recycling could be done for $0.25-0.50 per kg, and therefore be competitive with disposal costs.

The financial costs of battery product stewardship will ultimately, of course, be borne by consumers as these costs are passed through the supply chain. It is in the supply chain's best interests to minimise costs to consumers, especially for relatively low margin products such as handheld batteries. A well designed product stewardship framework that, at a minimum, provides regulatory certainty and addresses free riders should enable producers to minimise the costs ultimately passed on to consumers while allowing the battery supply chain as a whole to demonstrate producer responsibility.

PROPOSED FRAMEWORK AND FOUNDATIONS FOR RIS

Principles for best practice regulation have been agreed by COAG[60]. These principles are provided in Table 4.

Table 4: COAG principles of best practice regulation

COAG has agreed that all governments will ensure that regulatory processes in their jurisdiction are consistent with the following principles:

1. establishing a case for action before addressing a problem;
2. a range of feasible policy options must be considered, including self-regulatory, co-regulatory and non-regulatory approaches, and their benefits and costs assessed;
3. adopting the option that generates the greatest net benefit for the community;
4. in accordance with the Competition Principles Agreement, legislation should not restrict competition unless it can be demonstrated that:-
    a. the benefits of the restrictions to the community as a whole outweigh the costs, and
    b. the objectives of the regulation can only be achieved by restricting competition;
5. providing effective guidance to relevant regulators and regulated parties in order to ensure that the policy intent and expected compliance requirements of the regulation are clear;
6. ensuring that regulation remains relevant and effective over time;
7. consulting effectively with affected key stakeholders at all stages of the regulatory cycle; and
8. government action should be effective and proportional to the issue being addressed.

It is beyond the scope of this project to provide the detailed analysis that would be contained in a consultation RIS to fully conform with these principles and provide the basis for Ministerial decision-making. However, these principles provide the basis for exploring alternative approaches to battery stewardship in Australia and formulating analysis of options.

This report aims to develop a set of options for EOL batteries by considering a range of options to address the problems of EOL batteries and the key factors relevant to developing options for further evaluation.

The *Australian Government Best Practice Regulation Handbook* identifies a series of regulatory and non-regulatory options that should be considered:

- **Self-regulation** - Industry-formulated rules and codes of conduct, with industry solely responsible for enforcement;
- **Quasi-regulation** - a wide range of rules or arrangements where governments influence businesses to comply, but which do not form part of explicit government regulation;

- **Co-regulation** - industry develops and administers its own arrangements, but government provides legislative backing to enable the arrangements to be enforced; and
- **Explicit government regulation** - primary and subordinate legislation.

This report identifies and describes a set of possible options to address EOL batteries. These options would need to be elaborated in a consultation RIS and decision RIS process using cost benefit analysis before co-regulatory or mandatory options could be approved by the Standing Committee on Environment and Water and implemented.

Although there would likely be a range of options available, for the purposes of this report the following have been analysed:

- **Option 1** – National Voluntary Battery Stewardship;
- **Option 2** – National Battery Covenant;
- **Option 3** – Co-regulation of batteries under the Act; and
- **Option 4** – Battery Extended Producer Responsibility.

These options were selected as being most likely to address the problems identified, reflect international experience and reflect input from stakeholders.

The following descriptions are intended to provide indicative analysis that would be further subject to a consultation RIS.

Option 1 – National Voluntary Battery Stewardship

A national voluntary battery stewardship approach would be comparable to the current base case, wherein organisations such as MRI, CMA Ecocycle, Close the Loop and SITA Australia collect batteries from businesses and councils for recycling, and retailers including Battery World, IKEA and ALDI provide free drop-off services for consumers.

Net costs of recycling batteries would be recouped on a fee-for-service basis, potentially offset by increased foot traffic for retailers or subsidised from other aspects of the organisations' activities. A voluntary approach that incorporates state and local government would also continue to require collection and recycling costs being paid through public funds, which runs counter to the objectives of product stewardship.

One variant of a voluntary approach would be to have a national body funded voluntarily by interested industry players, comparable to the MobileMuster program for mobile phones and accessories.

Strengths would include flexibility in adoption and implementation for early actors. A voluntary approach would also avoid the time delays and development costs involved with measures that involve some degree of regulation.

A significant weakness would include placing a financial burden disproportionately on participating organisations and exacerbation of the 'free rider' problem consistently raised by stakeholders. Access and education for consumers could be patchy, especially in remote or rural areas where recovery is less viable.

ABRI's preference is for a voluntary product stewardship program, funded by brand owners and importers. However, ABRI has indicated that without the support of major brand owners and importers, some form of regulation will be required to achieve higher recovery rates.[61]

Option 2 – National Battery Covenant

Under principles for best practice regulation, quasi-regulation involves governments influencing businesses to comply without explicit government regulation. One means of quasi-regulation could be for governments and industry to negotiate a National Battery Covenant comparable to the Packaging Accord that New Zealand negotiated for packaging, or the sustainability covenants into which the Victorian Government has entered with various industry organisations.

For this approach to succeed governments would need to indicate their willingness to move to a regulated model if the voluntary approach is not effective in achieving its objectives. The lack of any regulation or government funding would distinguish a National Battery Covenant from the Australian Packaging Covenant, which includes regulatory underpinning through a National Environment Protection Measure and government matching of industry funding up to a prescribed amount.

International experience indicates that mature battery collection systems achieve return rates of around 50%, so this level might be an appropriate long-term recovery target under a National Battery Covenant. Any recovery or 'convenience' (consumer access) targets that may be agreed would be purely voluntary. Reporting could prove problematic, as monitoring and reporting would be discretionary and may be cut back to reduce costs in difficult economic times.

As with a purely voluntary approach under Option 1, a significant weakness would include a financial burden falling disproportionately on participating organisations and exacerbation of the 'free rider' problem.

Option 3 – Co-regulation of batteries under the Product Stewardship Act 2011

A co-regulatory approach under the Act could include recovery and access requirements comparable to the Scheme for TVs and computers, and could potentially be implemented through expansion of the existing Scheme. Liable parties above a certain volume threshold would be determined, then regulated through Customs (we note that Customs data for batteries is severely limited compared to that for most electronics). A co-regulatory approach could potentially be easier for batteries than for other products, as all batteries consumed in Australia are imported.

A co-regulatory approach could combine the flexibility of programs such as Call2Recycle with a regulatory underpinning to help address 'free riders.' This is something that Call2Recycle is currently seeking to address through introduction of EPR regulations in the US. The Corporation for Battery Recycling (CBR) in the US, representing manufacturers of alkaline primary batteries, have also shifted their focus from voluntary stewardship to regulation[62]:

> *CBR's three founding companies — Duracell, Energizer and Panasonic — remain committed to their vision of leading and shaping a national household battery-recycling program. CBR is also exploring appropriate legislative solutions during 2013 as a means to best level the playing field and create fair participation by key players.*

The regulatory underpinning would force battery manufacturers and importers to participate and likely redirect their attention to minimising compliance costs.

Option 4 – Battery Extended Producer Responsibility.

Under full battery EPR, strict take back requirements would apply to producers, but could be discharged through producer responsibility organisations on a fee-for-service basis or through license fees. Strict recovery and access requirements would apply, with financial penalties or market restrictions for non-compliance. Examples include the EU Batteries Directive and UK and Belgian experience under the Directive. INOBAT and BEBAT are subject to specific provisions in legislation,

and these types of provisions can limit commercial drivers or cause concern if the provisions are not set sensibly in the enabling legislation. EPR could potentially be easier for batteries than for other products, as all batteries consumed in Australia are imported.

EPR would clearly force the major battery manufacturers to participate. The European and North American stakeholders consulted for this report see EPR as the most straightforward way to address 'free riders'.

Regulatory threats and fees have been used heavily in Europe, but have delivered strong results. Belgium has had return rates of ~50% over the past decade and Switzerland has had return rates of ~65-70% since the late '90s under EPR. Call2Recycle has recovered almost twice as much battery volume as each of these programs, but from a much larger population base (235 million in the US versus 8-11 million).

Whilst the Swiss and Belgian programs are the best performers, other EPR programs have not performed as well despite having regulations in place. Many EPR programs are also quite expensive.

RECOMMENDATIONS FOR ACTION AT A NATIONAL AND STATE LEVEL

Given the scope of this project and strong support from stakeholders for a nationally consistent approach, MS2's recommendations focus predominantly on a national approach, however most recommendations can also be applied to state-based programs.

The April 2011 Battery Recycling Summit in the US[63] developed four common themes and principles of a proposed national system to recycle batteries:

- Consumers are key – system must be convenient and convenient for customers
- Industry-led and market-driven
- Multi-stakeholder collaboration
- Net positive environmental and social impact, as well as sustainable economics.

At SV's battery strategy workshop with stakeholders, the GlobalPSC highlighted recent research findings that show it is almost irrelevant whether a product stewardship program is designated as being voluntary, co-regulatory or regulatory, as long as the following features are addressed:

- Ongoing consumer education
- Convenient access to collection facilities
- Verifiable performance reporting
- Producer responsibility for operating and financing.

Recommendation 1. Support including handheld batteries in the 'product priority list' for the *Product Stewardship Act* (Clause 108A).

Handheld batteries satisfy the objects and criteria of the Act. There is strong support amongst stakeholders for a nationally consistent co-regulatory approach to product stewardship as an appropriate balance between having a regulatory 'safety net' whilst providing flexibility in program design and implementation.

Recommendation 2. Support provisions for ensuring producer responsibility for program operation and financing.

Producer responsibility is a fundamental premise of EPR and product stewardship. Flexibility can be allowed, however, on the means by which producer responsibilities are discharged.

Recommendation 3. Engage retailers currently collecting batteries in the development of any potential national approach.

Any potential national approach for batteries should engage retailers already collecting batteries in order to gain insight from their experience and to ensure that these retailers are not disadvantaged for acting early.

Recommendation 4. Ensure that battery recycling is convenient and accessible for consumers.

Consumers consistently seek information on battery recycling and are likely to bring batteries in for recycling. Ongoing retailer collections are seen by various stakeholders as being convenient and accessible however they may be more expensive than alternative approaches. The Scheme for TVs and computers contains 'reasonable access' requirements that could provide a useful model, however the requirements for batteries would be different than for electronics. Consumers have clearly expressed support for retailer return of batteries, as opposed to the depot or drop-off centre models widely used for collection of electronics. Various stakeholders reinforced the importance of keeping collections as simple as possible for consumers.

Recommendation 5. Ensure verifiable public reporting of program results.

Reporting requirements should focus on transparent and verifiable public reporting against key performance indicators that should be developed in conjunction with liable parties. Having such requirements, yet allowing liable parties flexibility in how the results are achieved, has been key to ensuring good program results in locations such as British Columbia.

Recommendation 6. Ensure that program parameters are clearly defined before setting any program targets.

UK experience in particular highlights the significance of clarifying program parameters and definitions before setting any program targets. Batteries should also be classified in ways that are consistent with how they are already viewed by the recovery chain, especially by chemistry type. Liable parties will need to be clearly defined under any co-regulatory or regulatory program.

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APPENDIX A - BATTERY CHEMISTRY

TableA-1: Composition of single use batteries

Material	Alkaline manganese	Zinc carbon	Mercuric oxide (button)	Zinc air (button)	Lithium (button)	Alkaline (button)	Silver oxide (button)	Lithium manganese
Iron & steel	24.8%	16.8%	37.0%	42.0%	60.0%	37.0%	42.0%	50.0%
Lead		0.1%						
Manganese	22.3%	15.0%	1.0%		18.0%	23.0%	2.0%	19.0%
Nickel	0.5%		1.0%		1.0%	1.0%	2.0%	1.0%
Lithium					3.0%			2.0%
Silver							31.0%	
Zinc	14.9%	19.4%	14.0%	35.0%		11.0%	9.0%	
Mercury			31.0%	1.0%		0.6%	0.4%	
Other metals	1.3%	0.8%					4.0%	
Alkali	5.4%	6.0%		4.0%		2.0%	1.0%	
Carbon	3.7%	9.2%	1.0%	1.0%	2.0%	2.0%	0.5%	2.0%
Paper	1.0%	0.7%						
Plastics	2.2%	4.0%	3.0%	4.0%	3.0%	6.0%	2.0%	7.0%
Water	10.1%	12.3%	3.0%	10.0%		6.0%	2.0%	
KOH			2.0%					
Other non-metals	14.0%	15.2%		3.0%	13.0%	14.0%	4.0%	19.0%
Other material			7.0%					

KOH = potassium hydroxide

Source: ABRI 2012 based on data from Fisher et al (2006), pp. 55-57

TableA-2: Composition of rechargeable batteries

Material	Nickel cadmium	Nickel metal hydride	Lithium ion	Lead acid
Aluminium			5.0%	
Cadmium	15.0%			
Cobalt		4.0%	18.0%	
Iron & steel	35.0%	20.0%	22.0%	
Lead				65.0%
Manganese		1.0%		
Nickel	22.0%	35.0%		
Lithium			3.0%	
Zinc		1.0%		
Other metals		10.0%	11.0%	4.0%
Alkali	2.0%	4.0%		
Carbon			13.0%	
Plastics	10.0%	9.0%		10.0%
Water	5.0%	8.0%		
H_2SO_4				16.0%
Other non-metals	11.0%	8.0%	28.0%	
Other material				5.0%

H_2SO_4 = sulphuric acid
Source: ABRI 2012 based on data from Fisher et al (2006), pp. 57-58

APPENDIX B - ORGANISATIONS CONSULTED

Organisations consulted for this report that agreed to be named include the following (in alphabetical order):

ALDI

Australian Battery Recycling Initiative

Call2Recycle

Energizer

G&P Batteries Ltd (UK)

Global Product Stewardship Council

Infoactiv Group

MobileMuster / Australian Mobile Telecommunications Association

MRI (Aust) Pty Ltd

Procter & Gamble (owners of Duracell)

Planet Ark Environmental Foundation

TES-AMM Australia Pty Ltd

Western Australia Local Government Association

Other organisations that were contacted on multiple occasions (including a combination of phone and email contact) but did not provide formal responses include:

Battery World Australia Pty Ltd

Bunnings Group Limited

Consumer Electronics Suppliers Association

Panasonic Australia Pty Ltd

APPENDIX C - ORGANISATIONS PARTICIPATING IN SV WORKSHOP

SV, ABRI and the GlobalPSC facilitated a workshop for SV in August 2012 with the objective of developing a strategic plan to address domestic battery stewardship over the next three years. Other organisations participating in the workshop include the following (in alphabetical order):

Battery World Australia Pty Ltd

Bunnings

Canon Australia

Close the Loop Ltd

Coles Supermarkets

Consumer Electronics Suppliers Association

MobileMuster / Australian Mobile Telecommunications Association

MRI (Aust) Pty Ltd

NSW Environment Protection Authority

Officeworks

[1] ABRI 2012

[2] ABRI 2012

[3] According to BatteryBack data provided by SV.

[4] The Australian Battery Recycling Initiative (ABRI) was formed by a group of battery manufacturers, recyclers, retailers, government bodies and environment groups to promote the collection, recycling and safe disposal of all batteries. ABRI supports the principle of product stewardship: that responsibility for environmental management of products, including their recovery at end of life, is shared by organisations at every stage of the product life cycle. Details are available at www.batteryrecycling.org.au.

[5] The Global Product Stewardship Council is an independent, non-profit association dedicated to understanding and advancing the principles of product stewardship. With offices or facilities in 11 countries, members include businesses, non-government organisations and local, state and federal governments. Sustainability Victoria and Martin Stewardship & Management Strategies Pty Ltd are members. Details are available at www.globalpsc.net.

[6] ABRI 2012

[7] ABRI 2012

[8] This report includes brand owners and importers as 'producers'.

[9] COAG 2007

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[11] http://batteryuniversity.com/learn/article/global_battery_markets, accessed May 2013

[12] Pillot 2012

[13] ABRI 2012

[14] Planet Ark 2010

[15] ABRI 2012

[16] Personal communication with Rebecca Brown of WALGA in January 2013

[17] http://www.mobilemuster.com.au/

[18] http://www.epa.gov/osw/conserve/materials/ecycling/certification.htm, accessed February 2013.

[19] http://e-stewards.org/, accessed February 2013.

[20] http://www.weee-forum.org/weeelabexproject, accessed February 2013.

[21] R2 certification status is current as of end-March 2013 and based on public reporting of R2 certifications available at http://www.r2solutions.org/certified/electronic-recyclers-with-r2-certified-facilities/.

[22] http://www.auszinc.com.au/

[23] http://www.ausbatt.com.au

[24] http://www.cmaecocycle.net/about-us/, accessed April 2013

[25] Personal communications with Mick Jumpertz of CMA Ecocycle in April 2013

[26] http://ec.europa.eu/environment/waste/batteries/index.htm, accessed January 2013.

[27] http://www.environment.gov.au/settlements/waste/publications/pubs/product-stewardship-na-eu.pdf, accessed January 2013, contains additional detail and lessons for Australia.

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[38] http://www.call2recycle.org/faqs/, accessed April 2013

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[41] Amarakoon, Smith and Segal 2013

[42] ABRI 2012

[43] ABRI 2012

[44] Giurco et al 2010

[45] Amarakoon, Smith and Segal 2013, p.56

[46] MIT 2011

[47] Available at http://www.epbaeurope.net/090607_2006_Oct.pdf, accessed April 2013

[48] ABRI 2012

[49] Hyder 2009

[50] Personal communication with Rebecca Brown of WALGA in January 2013

[51] http://en.wikipedia.org/wiki/Minamata_Convention_on_Mercury, accessed May 2013

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[53] Planet Ark 2010

[54] European Commission 2010

[55] ABRI 2012

[56] Planet Ark 2010

[57] http://www.call2recycle.org/drop-shop-retail-recycling-programs-provide-great-environment-for-consumers/, accessed May 2013

[58] Personal communications with Mick Jumpertz of CMA Ecocycle in April 2013

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[60] COAG 2007

[61] ABRI 2012

[62] http://recyclebattery.org/recent-updates/, accessed May 2013

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