Municipal Waste Advisory Council
Battery Avoidance Strategies
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Accompanying Paper to MWAC Battery Collection Study

Prepared on behalf of the Waste Management Board under Strategic Waste Initiatives Funding

1. Introduction

In Australia, over 267 million primary batteries and 50 million secondary batteries (rechargeable) were imported in 2004 (ABS, 2005). It is estimated that 18 million used primary and secondary batteries are disposed of annually in Western Australia (WasteWise WA, 2007).

Batteries are identified as a problematic material in the waste stream. They contain a number of metals which have documented impacts as environmental contaminants.

Understanding this, the Municipal Waste Advisory Council gained funding under Strategic Waste Initiative Scheme (SWIS) from the Waste Management Board of Western Australia.

The Municipal Waste Advisory Council has undertaken this study to investigate models for reducing the disposal of consumer batteries to general household waste and for collecting consumer batteries for specialised disposal and/or recycling in Western Australia

The key objectives of this study are:

- To minimise the disposal of untreated consumer batteries to landfill; and/or
- To minimise interference by consumer batteries with resource recovery operations; and/or
- To minimise the resource consumption associated with consumer batteries.

The study will address these key objectives using two different strategies. The first, undertaken in the accompanying paper *Battery Collection Study,* will research models for the collection of consumer batteries and will conclude with a set of recommendations on the best collection models. The second strategy, addressed in this paper, will focus upon avoidance as a method for reduction in the consumption and hence disposal of household batteries into general household waste.

2. Rechargeable Vs Disposable Batteries

The use of rechargeable batteries in the place of primary (disposable) batteries is one simple method for reducing the consumption and disposal of household batteries (RBRC, 2006).

The different types of rechargeable batteries include Nickel-Cadmium (Ni-Cd), Nickel-Metal Hydride (NiMH), Lithium Ion (Li-ion), and Rechargeable Alkaline Manganese (RAM). The applications and specifications for use of each of these batteries do differ, not just between rechargeable batteries, but to that of primary batteries. Hence, an understanding of what the consumer is using their household batteries for is necessary before promoting the use of a particular rechargeable battery as a substitute. Most applications for Li-ion, NiMH and NiCd are in products such as cameras, mobile phones and portable tools, which ordinarily will include the battery at point of purchase. The batteries are usually designed specifically for the product or brand and consumers do not a have choice in the type of battery they may select.

RAM can be used to substitute normal disposable alkaline batteries. Rechargeable alkaline batteries offer some advantages over other rechargeable batteries because they have lower toxicity. However, information on the feasibility of recycling rechargeable alkaline batteries was unable to be obtained and it has been assumed that this would be the same as recycling normal alkaline batteries. This makes recycling other rechargeable batteries (NiMH, NiCd, and Li-Ion) significantly more feasible. Ni-Cd and NiMH can be recycled to recover Cadmium and Nickel and Li-Ion can be recycled to recover Cobalt. In Western Australia, these batteries are currently collected by some waste collectors (Cleanaway, 2007) and shipped to France where they are recycled. However, primary (single powercycle) batteries still have no effective recycling

technology to make it economically or practically viable (for quantities recovered) to make recycling feasible.

Although manufacturing single-use batteries uses more energy than recharging secondary batteries, the environmental impacts associated with battery recharging should also be considered. The household electricity used to recharge batteries may come from various sources (e.g. coal a non-renewable resource) all of which have environmental impacts. Also, people tend to overcharge rechargeables, thus using more electricity than required. This is particularly for Ni-Cd batteries that discharge even when they are not in use, requiring them to be recharged frequently (Recycling Council of Ontario, 2007).

Re-packing is one method of prolonging the life of rechargeable batteries and minimising the waste created. Battery repacking involves the removal of those cells from a Nickel Cadmium battery that are unusable and replacing them with fresh cells (Planet Ark, 2007). The cost of doing so is less than the cost of a new battery and usually the performance of the battery is enhanced in the process.

In this study, no specific research could be found with a lifecycle analysis comparison of rechargeable batteries vs. primary batteries. However, there was the assumption from most sources that the long term the upfront costs of rechargeable batteries are outweighed by their long-term economic saving and environmental benefits. As certain rechargeable batteries are more toxic then others, it is hypothesised that the outcome of such a study would depend upon the type of rechargeable and primary batteries studied. An area for further research would be whether primary batteries, with their lowered toxicity but higher consumption have less environmental impact than fewer rechargeable batteries with a high toxicity. This would also need to take into account the possible slow phase out of Ni-Cd in preference of their lower toxicity replacement Ni-MH.

Legislation requiring a lowering in toxicity of rechargeable batteries has been implemented in several countries such as the United States and European Union. Coupled with a promotion of rechargeable batteries, this could be a more strategic approach to reducing the impact of household batteries in landfill.

Reid Waste Consulting (2006) has listed three different strategies for lowering battery consumption by promoting the use of rechargeable batteries over primary batteries. These include: promotion and advertising; landfill bans and fines; and market based instruments.

2.1 Promotion and Advertising

Given the potential economic savings and lowered environmental impact resulting from a reduction in the volume of batteries going to landfill by using rechargeable batteries, promoting their use to consumer's remains a desirable goal. A public education program can heighten the community's awareness of: the need to reduce heavy metals in the waste stream; reduce battery consumption, economic savings involved; and environmental impacts.

The Rechargeable Battery Recycling Corporation (RBRC) is an industry-initiated program, supported and paid for by more than 285 manufacturers and marketers of portable rechargeable batteries and products in the United States (RBRC, 2007). The RBRC was established under the *Mercury-Containing and Rechargeable Battery Management Act* 1996 (Battery Act), which required the EPA to establish a public education campaign on battery recycling. The Act targets product manufacturers and waste handlers, not consumers. Whilst the RBRC function is promoting recycling of rechargeable batteries it also serves the dual purpose of promoting rechargeable battery use. The Corporation provides an example of how both promoting

rechargeable batteries and methods for practical battery recycling can be delivered as a combined message (RBRC, 2007).

In Western Australia are several waste streams where the State Government has developed an overarching and general promotion strategy which was then available to Local Governments and community groups for distribution in their own areas. Some examples of this are template household hazardous waste and home composting educational and promotional materials (ZeroWaste WA, 2007). The WasteWise Schools program could also be used as a vehicle for promoting the recycling of and use of rechargeable batteries.

Despite the assumed economic and environmental saving from using rechargeable batteries, primary batteries remain the most heavily utilised (Coles Ltd, 2007). One possible reason for this is convenience; rechargeable batteries require self-organisation on the consumer's behalf for the recharging, while disposable batteries do not. Education about the impacts of batteries in landfill and lost resources associated with the failure to recycle the constituent materials is one way of motivating consumers to take up rechargeable batteries.

A state-wide campaign, both focusing on the use of rechargeable batteries and recycling of batteries could easily be combined with other wastes. Any education campaign encouraging the use of rechargeable batteries should include high impact messages on the need to recycle rechargeables and their toxicity. It should also be accompanied by well established collection operations for rechargeable batteries.

2.2 Landfill Bans and Fines

Landfill bans and fines are one method of driving a reduction in the consumption of batteries from the bottom-up. They include a regulated ban of either all batteries or certain types of batteries (usually the most toxic) going to landfill. Fines are used as the disincentive. Who would bear the burden of the fines: the householder: waste collector; or landfill operator; would depend upon the system.

The US *Battery Act* (RBRC, 2007) legislated against certain types of rechargeable batteries being sent to landfill. However, these batteries (NiCd and Mercury) already have established and viable recycling processes and markets for their product. To establish such landfill bans and fines requires considerable investment in education and enforcement. This is not withstanding the actual feasibility of extracting compact household batteries from waste going to landfill. Illegal dumping is one issue arising from the imposition of any landfill ban; however, in this case, it is likely policing the batteries going to landfill would be more of an issue.

In the report prepared for the Department of Environment and Conservation investigating environmental, social and economic impacts of a potential ban on disposal of household recyclables products it was concluded that landfill bans should only be imposed where: it is determined that there is demand for the material arising from the ban; and recycling infrastructure services are available to adequately manage the materials arising from the ban (GHD, 2006). In this case, there is no operational infrastructure to recycle batteries in Australia, nor is there a high demand for the recycled product.

For the reasons aforementioned landfill bans and fines were not considered as a feasible method of driving a reduction in the consumption of household batteries. In the future if and when recycling options emerge that can be applied to WA, this strategy could be explored further.

2.3 Market Based Instruments (MBI's)

Market based instruments are defined by the Australian Government as using "trading mechanisms, auctions and price signals to positively influence the behaviour of people" (2007). MBI's work through changing the market prices, altering quantities of a particular good, improving the functioning of the market and through market creation (Australian Government, 2007).

In relation to batteries there are two main types of MBI's which could be effective. These are:

- 'Price-based' - change behaviour by changing prices in existing markets (such as taxes, levies or subsidies); and/or
- 'Market friction – making the existing market work better (such as disclosing information for example – eco-labelling of products) (Whitten et al, 2004).

A combination of these two MBI's may be the most effective way to reduce consumption, for example through labelling batteries as recyclable and imposing a levy on non-recyclable batteries. It is noted that a more comprehensive assessment of MBI's and their effectiveness for this material type is needed.

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