The environmental impact of throw-away versus re-chargeable batteries for consumer use

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Introduction

There is a huge and growing demand for small batteries in Australia to power all manner of electronic equipment from portable CD players to toys. Many batteries are simply thrown in the local rubbish bin when flat but there is also a growing demand for re-chargeables.

Users can buy either numerous throw-away batteries or a small number of re-chargeables and a battery charger. Studies of the environmental consequences of each of these two alternatives using life cycle analysis techniques show that the re-chargeable option is far preferable from both an environmental and an economic point of view.

Figure 1 shows the dollar value of various battery imports into Australia in the year 2004. The category "throw-away" comprises the bulk of consumer throw-away batteries which most consumers use for their everyday purposes.

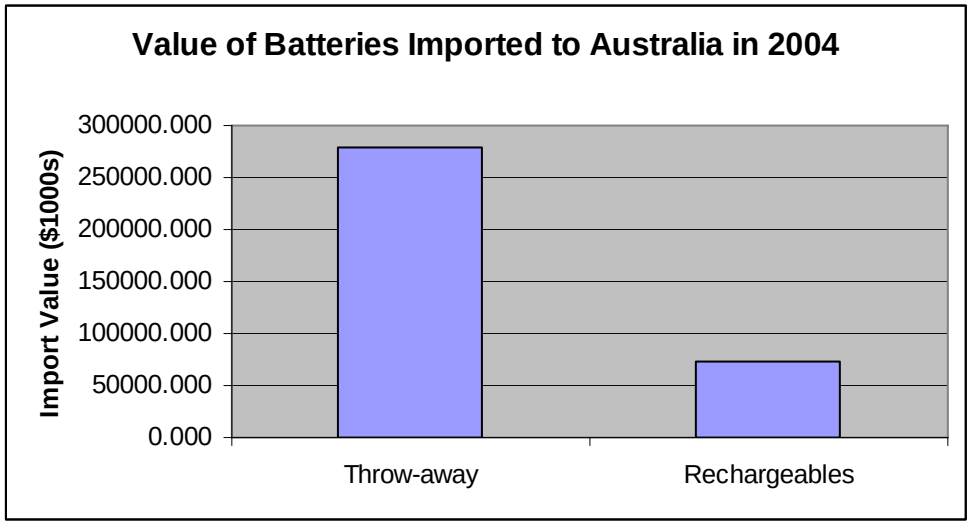

Figure 1
Source: Australian Bureau of Statistics (2005)

Life cycle analysis involves accounting for all material inputs and outputs into a product all the way from mining of resources through useful life to eventual disposal. This

technique has been used to compare the environmental performance of throw-away and re-chargeable batteries required to power a consumer device which operates on two AA cells.

The re-chargeable option consists of two re-chargeable AA cells and a battery charger. The cells were re-charged 400 times, a relatively conservative figure based on manufacturer's claims but one chosen to allow for likely consumer use which may be less than optimum. Each cycle of use delivers 924 mAh to the load. Batteries are assumed to be disposed of into normal Australian landfill at the end of their life.

Nickel cadmium batteries are analysed because of more readily available data, even though they are being replaced in the market by the more environmentally friendly nickel metal hydride technology. There is however little difference between the two in this analysis because it involves only two cells and analysis of the difference in this context indicates only small differences relative to the other impacts.

Measurements on typical cells and a typical charger indicate that the amount of electrical energy required to charge the cells after discharge was about 130% of the energy able to be recovered from the cells during use.

Measurements of the energy efficiency of a typical battery charger under typical conditions likely to be those adopted by a consumer, give a figure of about 77%.

The throw-away option consists of 920 alkaline AA cells which were disposed of into normal Australian municipal landfill. This number of cells are required to provide equivalent energy into the device being powered to the re-chargeable batteries used 400 times.

Factors such as transport of batteries and the charger from a typical country of manufacture have been included in the analysis. So too has local distribution transport in Australia and storage and distribution in the wholesale and retail sector.

Results of Life Cycle Analysis

Life cycle analysis has the ability to give results on numerous criteria is such as the impact on human health, global warming, and resource depletion. These analyses are based on the science of the different areas and use measures which allow aggregation of data from different environmental impact sources.

An example of such data is carbon dioxide equivalent as a measure of global warming. Methane has a greater impact here than carbon dioxide so its impact is weighted accordingly.

Figure 2 shows the relative environmental impact of the two alternative battery systems on a selection of these criteria.

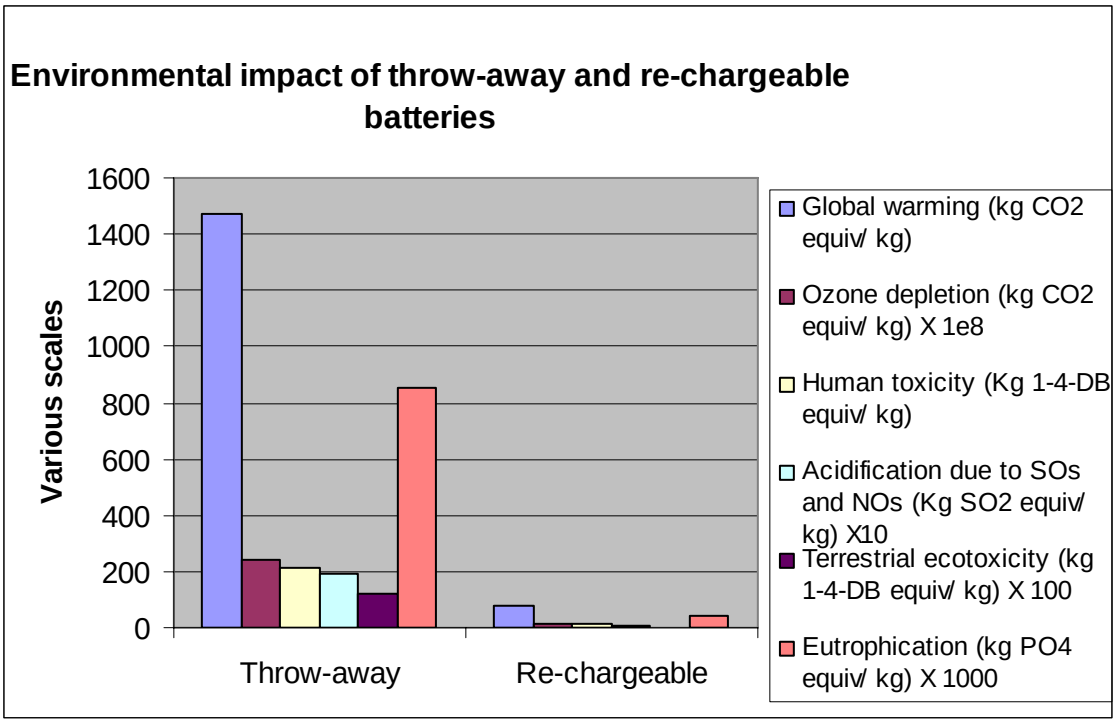

Figure 2

These results show that re-chargeable batteries have a major advantage over throw-away batteries on every measure.

Simple Consumer Economic Analysis

Since the above analysis suggests a considerable environmental advantage in using re-chargeable batteries for consumer equipment, an analysis of the related costs is also of interest.

Using re-chargeable batteries involves:

- The purchase of two NiMH AA cells, @ $4.25 or $8.50
- The purchase of a charger used for 20% of its' life on this task, at cost of $29.98 or $7.50.
- Charging the cells 400 times, or 3.34 kWh @ 14 c per kWh, or $0.47

So total monetary cost is $16.47.

Using throw-away batteries, involves simply the purchase of 920 single AA alkaline cells, at a typical price of $1.10 each, or $1012.

Figure 3 shows a simple comparison of costs.

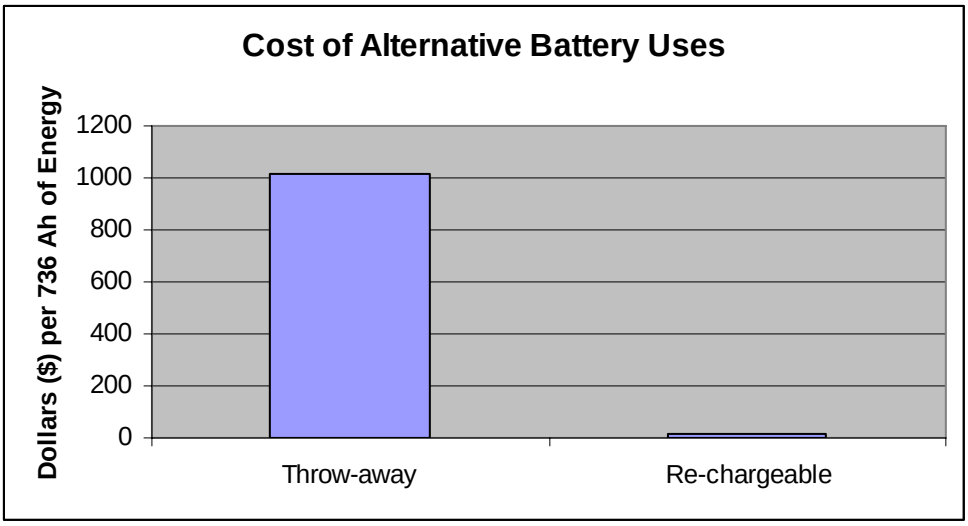

Figure 3

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